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ABSTRACT

This report presents preliminary research concerning learners whose native language is not English and who attend school in the state of New York, focusing on how English-as-a-Second-Language (ESL) teachers in the state view and use technologies to help develop their students' literacy skills. Data are drawn from a statewide survey and initial interviews with 56 ESL teachers who use technology in teaching. The report summarizes: population trends and ESL instruction throughout the United States and within New York State; issues in literacy and second language learning, based on current research; practical, pedagogical, and empirical bases for using instructional technologies in language and literacy instruction; extent of use, in ESL contexts, of software designed for native English-speakers and for non-native speakers; access to computer technology; the reasons teachers give for using software in these ways at each school level (elementary, middle, high school); and use of electronic mail and the Internet. Conclusions are drawn about how and why technologies are being used as they are. Contains 55 references. (MSE)

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TECHNOLOGIES USE WITH ESL LEARNERS IN NEW YORK STATE: PRELIMINARY REPORT

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The Center on English Learning & Achievement (CELA) is a national research and development center located at the University of Albany, State University of New York, in collaboration with the University of Wisconsin-Madison. Additional research is conducted at the Universities of Oklahoma and Washington.

The Center, established in 1987, initially focused on the teaching and learning of literature. In March 1996, the Center expanded its focus to include the teaching and learning of English, both as a subject in its own right and as it is learned in other content areas. CELA's work is sponsored by the Office of Educational Research and Improvement (OERI), U.S. Department of Education, as part of the National Institute on Student Achievement, Curriculum, and Assessment.

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TECHNOLOGIES USE WITH ESL LEARNERS IN NEW YORK STATE: PRELIMINARY REPORT

Carla Meskill
Jonathan Mossop

The Technology and Literate Thinking Group of the National Research Center on English Learning & Achievement (CELA), is concerned with school age children's contact with electronic literatures and how interaction with these texts affects English language and literacy development. This report presents preliminary research concerning a specific population of learners: learners whose native language is not English and who attend school in the state of New York. Our research focused on how ESL (English as a Second Language) teachers in the state view and use technologies to help develop their students' literacy skills. Data from a statewide survey and from initial interviews with 56 ESL teachers who use technologies in their teaching are discussed.

TECHNOLOGIES AND ESL

The number of non-native English speaking children in U.S. public schools continues to rise dramatically. By one estimate, public school enrollment is projected to rise by 44 million by the year 2000 with nearly all of this increase being in minority, especially Hispanic, enrollment (National Council of La Raza, 1990). New York State is representative of this increase both in terms of sheer numbers and in terms of demographic distribution in urban areas, small and large. In the last decade, New York demographics of non-native speakers of English have followed the national trend with a 100% increase in the number of ESL learners in the public

schools (from 96,666 in 1988-89 to 200,553 in 1995-96). Moreover, the state of New York is third in the nation in the number of ESL learners it serves.

One consequence of this ever growing population of children in need of language and literacy support is increasing interest on the part of administrators, teachers, and publishers in the use of technologies in ESL instruction. The past five years have seen a substantial increase in the number of ESL software products on the market and, as indicated in our statewide survey responses, growing recognition of various roles technologies can play in supporting the language and literacy development of ESL learners. Many new software products currently marketed for ESL capitalize on both the capacity of multimedia to engage non-native speakers in language development activity and the widely perceived need for efficient, supplemental materials to meet the challenge of serving this population.

LITERACY AND SECOND LANGUAGE LEARNING: WHAT IS AT ISSUE?

Children who enter U.S. schools with limited English-speaking abilities face the dual challenge of learning how to read, speak, write, and understand a new language while at the same time mastering grade-level content that is most often *in* that new language.* That is, in addition to acquiring literacy and communication skills to function at a basic social level within the school setting, they must also, like their native-speaking counterparts, master cognitive academic skills such as dealing with abstract concepts, problem solving, critical thinking, and expression, which are highly language dependent. Moreover, language through the different grade levels increases in complexity and becomes less tied to the kinds of immediate, observable realities that support comprehension.

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* The exception being bilingual programs where children continue grade-appropriate work in the content areas in the native language while learning English.

> Language in school becomes increasingly complex and less connected to contextual clues as students move from one grade level to the next. Language becomes the focus of every content-area task, with all meaning and all demonstration of knowledge expressed through oral and written forms of language. (Collier, 1989:512)

As content becomes more abstract in the later grades, the difficulty involved in reading, writing, and understanding that content likewise increases. For the non-native speaker who has limited development of the language-dependent cognitive and academic skills needed for comprehension of subject matter content, the challenge is therefore great. Consequently, the amount of time required for learners of ESL to reach a functional level of Cognitive Academic Language Proficiency, or CALP, is from five to seven years, in contrast to the time they need to acquire Basic Interpersonal Communication skills or BICS (Collier, 1989; Cummins, 1983).

During the time it takes to develop CALP, ESL students must not only learn an additional language, but also develop the complex, higher-order thinking skills and related knowledge needed to undertake academic work in the content areas, a great deal of which involves reading. Reading texts in a second language is "subject to differences in linguistic structure, differently organized similarities in structure, differential knowledge of the language and ability to process it, as well as cultural disparities in the context and use for print" (Weber, 1991:114-115). In addition to general reading ability in the new language, ESL learners need the additional cognitive skills implied in CALP to be able to comprehend and learn increasingly complex, abstract content. The development of certain forms of reasoning which are central to the understanding and mastery of academic content—such as the ability to infer and generalize given a narrative or set of information—has, moreover, been shown to be a particular challenge in a second language (Perkins & Brutten, 1992). These forms of reasoning require close and, oftentimes, critical understanding, as well as other more complex forms of processing. For example, a reader or listener must evaluate, generalize, infer, and interpret relationships between elements in written and spoken texts (e.g., teacher lectures, class discussions) which are not explicitly stated. Such processes impose heavy demands on attention and recall. When undertaken in a second language, these demands are formidable since processing is mitigated by an unfamiliarity with both the language and the content.

A student's ability to understand and express understanding of subject matter is without question language dependent. However, understanding and expression also involve the integration of experiential knowledge grounded in both school and life experience. For learners from other cultures, issues such as perceptions of, attendant beliefs about, and experiences in home culture schooling—in addition to broader aspects of cultural belonging at home and in school—become essential in considering the development of these advanced cognitive academic skills. Considering the monocultural agenda of the majority of standard curricula in U.S. schools, any congruence between an ESL learner's experiential base and the demands of academic subject matter is not likely. Learners of other cultural identities, therefore, have the added challenge of trying to understand content that is presented uniformly through lenses of the host culture and, consequently, is not always open to interpretation through students' own experiences.

Not unrelated to cross-cultural issues and the exceptional challenges posed by linguistic and linguistic/academic development for non-native speakers in U.S. school settings, is the issue of affect. Research in motivation (Crookes & Schmidt, 1991), the negative impact of language learning anxiety (Gardner, Day & MacIntyre, 1992; Phillips, 1992), and cross-cultural attitudes (Ogbu, 1987), for example, consistently demonstrate how these affective variables impact second language learning and school achievement. Current notions concerning the centrality of affect in the language acquisition process itself are also gaining attention (Schumann, 1994, 1995). There is growing recognition of the potential for dissonance between children's two experiential spheres, that of their home culture and home life, and that of the host culture and school life. Indeed, the effects of this dissemblance have been well documented (Gee, 1990; Heath, 1980). In addition, the affective dimension of these children's school experiences and their self-concept in light of being "different" can also work to increase the already extraordinary challenges they face in developing English language skills and academic literacy proficiency.

Language teaching methodologies of the past few decades indeed recognize and accommodate the critical component of learning that is affective, in lieu of traditional instructional practice that is strictly cognitive (Asher, 1977; Curran, 1972; Fanselow, 1987;

Lozanov, 1979). The eclectic incorporation of process writing, response-based practices with literature, especially multicultural literature (Language Experience, Whole Language and similar approaches that take into account and value the background and experiences of non-native speakers) have become common practice. Because the need for access to, and the requisite skills required by, the content areas cannot be suspended while learners are acquiring functional participation skills, the ESL teacher emphasizes needed content-specific language and the attendant concepts that are particular to the subject area, as the focus of student learning. The current practice in ESL instruction with school-age children treats language as both the vehicle for becoming part of the school and wider culture and as a requisite tool for mastery of subject area content. There is systematic integration of language and content through which ESL teachers nurture a sense of acceptance in the school community for their students, including the incorporation of the native language and culture where possible, while, at the same time, teaching the English skills their students need to be active participants in class, school, and community activities.

TECHNOLOGIES AND ESL: THE MATCH?

Using computer-based technologies in ESL instruction makes sense practically, pedagogically, and to some extent, empirically.

Practical

Non-native speakers of English present special challenges for school administrations. For example, where half of the nation's states mandate the quantity and type of service to be provided to ESL learners, the other half are left to their own devices (Fleischman & Hopstock, 1993). Moreover, the number of trained, certified ESL professional educators has not kept up with the rapid increase in the numbers of children needing services (OBEMLA, 1996). This

situation is further complicated by the fact that: 1) the majority of districts nationwide have sparse, dispersed numbers of ESL learners in a single building or district; 2) the population is often transient; and 3) predicting the specific needs and amount of service each ESL learner will need makes hiring and retaining trained ESL professionals difficult. Given these conditions, technologies can be seen as representing a practical option in terms of both fulfilling contact hour requirements in states where this is mandated, and as a means of expediting English language development so children can become full participants in regular classroom and school activities where services are less systematically provided.

The prospect of providing language and literacy training for children learning ESL via computer is an intuitively appealing one. At the level of simple practicality, this is a potentially economical option in the minds of administrators who face the challenge of providing services to this population. The notion of *efficiency* that is intrinsically tied to anything "technological" is also part of this appeal. Tied to efficiency is the notion of economy. Per capita costs for ESL services are high. In most instances, there are so few ESL learners in a building that grouping is not possible. Variation among students in terms of their level of linguistic and literacy development also works against grouping. Outside of large urban areas the most common form of ESL service is one-on-one tutoring (Fleischman & Hopstock, 1993).

Another practical aspect of the use of technologies is that computers are something ESL learners can *do* when they cannot otherwise participate in class activities. The majority of typical ESL learners' time in school is spent in the regular classroom. There, because of limited English comprehension, they may struggle with the content of the subject matter areas as well as the communications-based dynamics of classroom life. Rather than lose a child during a language-intensive language arts lesson, for example, the regular classroom teacher can put an ESL learner on the computer; the perception then being that time is not being wasted. Because many instructional software packages also have tracking and record-keeping utilities, both teacher and student can have some tangible evidence of work done and progress made while the child works independently on-line.

Pedagogical

The intuitive match of multimedia computer software and language instruction is strong. Simulated contact with language in a variety of modalities—text, graphics, video, audio—over which learners can exercise some control and, in effect, interact can be seen as contact that is in keeping with the goals and processes of learning another language. Rich contexts made up of visual and auditory information provide environments in which learners can, in theory, become immersed and involved, and with which they can in turn make sense of and produce meaningful language. Moreover, the fact that learners can also exercise a certain amount of control over that environment is pedagogically compelling (Meskill, 1991a, 1996).

Reticent students who are not prone to risk taking in the regular classroom may also benefit from multimedia language learning (Chun, 1994; Meskill & Swan, 1996). On the computer a child can exercise thinking and action that is not necessarily subject to immediate peer and teacher judgment. As such, autonomous on-line experience, rather than carrying the potential for revealing lack of comprehension or errors in performance, can be viewed as a comfortable activity where the child's autonomy and self-efficacy are concerned. In other words, where ESL learners may feel disempowered to participate fully in the daily instructional stream, their on-line work is an opportunity for them to actually *do* something that is both academic and that carries a sense of accomplishment. On-line time also represents a reprieve for non-native speakers whose daily involvement in trying to understand and communicate in another language can prove to be exhausting.

In situations where an ESL instructor works with groups of students who are at varying levels of English-language ability and/or from different grade levels, computers represent a means of involving learners in activity that is tailored to their individual language ability and grade level as well as their individual learning needs and preferences. Instructors can thus distribute their attention and direct their support to individual learners as they work on skills in environments appropriate to their individual needs. Allowing learners to progress at their own pace through tasks and materials makes particular sense, as individual differences are particularly great among learners of ESL.

Given current understandings, trends, and emphases in the area of K-12 second language learning, the complexity of cognitive academic language proficiency, and the centrality of affect in the language acquisition process, technologies seem to make good pedagogical sense. Their use can make content from the subject areas more accessible and thereby empower ESL learners.

Empirical

The inherent awkwardness of applying traditional research methods to the study of the language and literacy learning of non-native speakers of English has been long documented (Beretta, 1992; Weinstein, 1984). The myriad factors—social, cultural, psychological, affective, and contextual—that contribute to the route and pace of a learner's progress in another language render traditional empirical methods of investigation of very limited utility. Any aspect of the acquisition process is difficult to assess quantitatively and the measurement problem is compounded when computer use is involved. Traditional research methods applied to computers and learning, such as studies comparing different treatments, have been criticized for an "apples and oranges" approach to what is in fact rich, complex human activity that cannot be treated as varying by single, isolatable factors (Crookall, Coleman & Oxford, 1992; Hativa & Lesgold, 1996; Pederson, 1988). Both the fields of second language learning and computer assisted instruction are, consequently, calling for alternative forms of research that attempt to account for the multiple and complex interrelation between individual and contextual factors.

In spite of the recent paradigmatic shift in the study of second language learning and the use of computers in instruction, the bulk of empirical work to date in Computer Assisted Language Learning (CALL) is comprised of a handful of "effectiveness studies" that attempt to determine a direct, causal relationship between computer use and student learning of, for example, vocabulary (Bueno & Nelson, 1993; Chun, 1994; Kang, 1995), listening comprehension (Grezel & Sciarone, 1994), speaking (Peterson, 1990), grammar (Swann, 1992), and writing (Pennington, 1993; Pennington & Brock, 1992; Silver & Repa, 1993). Such investigations

typically demonstrate some gains in student learning. However, due to constraints inherent in methodology (e.g., for the most part these studies involve clinical, decontextualized computer use and are of short duration), these investigations fall short of being able to claim medium effects directly related to the fact that instruction took place via computer. In all cases, similar learning could have occurred off-line given the amount of student contact time with materials.

Other investigations offer evidence that quick, efficient access to on-line reference and support material is instructionally supportive; that is, on-line dictionaries (Leffa, 1992), visual support for lexical items (Chun & Plass, 1996), and access to contextual clues to meaning (Bueno & Nelson, 1993) are helpful to language learners. There is additionally some evidence that suggests providing on-line learning guidance is of value to those students who do not possess strong language learning skills and strategies (King, 1991; Meskill, 1991b; Salomon, Globerson & Guterman, 1989). The most consistent evidence from empirical work with CALL has been that student attitude toward using the computer for language learning has been consistently positive (see, for example, Eichel, 1989 and Stevens, 1991). There is also some anecdotal evidence suggesting that computers represent an opportunity for non-native speakers to become experts in an area where the language barrier would otherwise prevent participation and opportunities for self esteem to be validated and enhanced (Cazden, Michaels & Watson-Gegeo, 1987; Johnson, 1985).

Due to methodological shortcomings, traditional comparison studies have yielded little practical evidence beyond the common sense conclusion that computer assisted language learning is as good as other forms of instruction. In some instances, computers may provoke greater enthusiasm for, and consequently greater task persistence with, language learning activity. To date, such empirical work on CALL has involved software products specifically designed for learners of another language while focusing on medium and instructional design effects. Exceptions include investigations of the discourse generated by language learners who are paired at the computer with a variety of software types (see, for example, Abraham & Liou, 1991; Meskill, 1993). Studies that move beyond single, software-specific features to account for the complex of contextual factors that constitute on-line language learning are sorely needed.

ESL AND USES OF TECHNOLOGIES

Our research into technologies use with ESL learners in New York State is concerned with the implications and effects of non-native speaker interaction with computer technologies, the patterns of this interaction, and influences on second language and second language literacy development. Our overall aim is to characterize what language professionals and mainstream teachers do well with technologies.

Our goals are:

1) to document intact contexts and processes for language and literacy learning that involve ESL learners and technology; and,

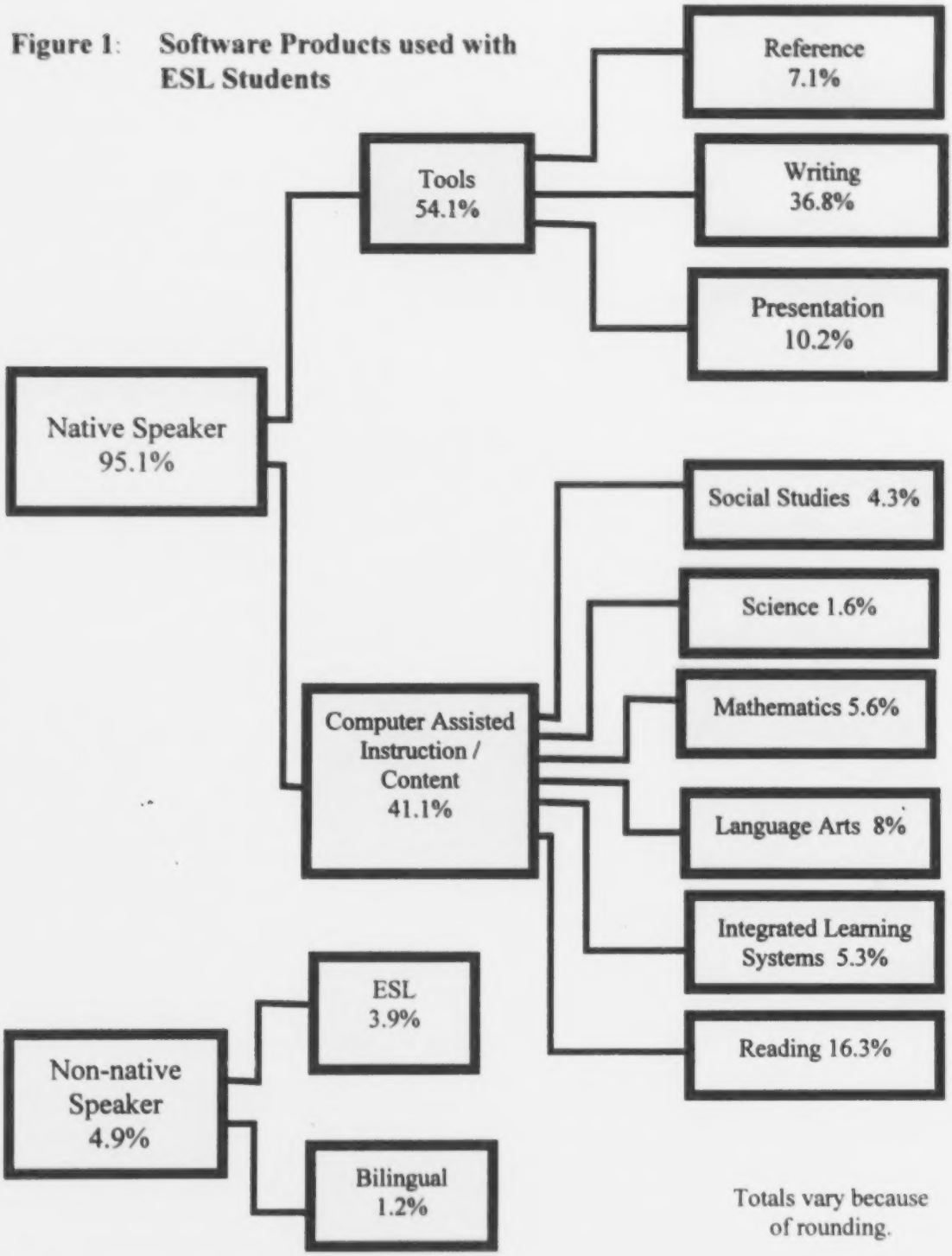
2) to systematically characterize the language and literacy development of ESL students using technologies over time.

THE ESL AND TECHNOLOGIES SURVEY

The Project's initial activity set out to document current, intact uses of technology with ESL learners in the state of New York. To that end, in collaboration with New York State's Office of Bilingual Education, building surveys that queried practitioners on the use of technologies with learners of ESL were distributed to those districts in the state known to have "Limited English Proficient" (LEP) populations, twelve hundred districts in total. Forty-nine percent of the 786 buildings that responded report that technologies are being used with their ESL children.

A set of survey responses that we have found to be particularly informative are those involving the software products language educators reported using on a regular basis with learners of ESL. Figure 1 presents a breakdown, by category, of those products New York State schools report using with learners of English as a second language. The percentages represent a raw count of individual software packages reported. The products were first categorized by

Figure 1: Software Products used with ESL Students



Totals vary because of rounding.

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whether their intended audience was native English speakers (NS) or non-native speakers (NNS).

A surprisingly large majority of software packages reported being used with learners of ESL are designed for native speakers of English (95.1% of the raw count of the total number of software products mentioned). Of these, tool software (e.g., word processing, reference tools, presentation software) is used slightly more than content specific software (software designed to be used with native speakers).

Non-Native Speaker Software

The fact that only 4.9% of the software products reported being used are those specifically designed for learners of English as a second language is remarkable, especially given the large number of such products now available and the aggressive marketing strategies publishers are employing to sell them. This limited use of ESL products is also curious in light of the "problem-solution" stance typical of many school districts when it comes to ESL learners. One would assume that ESL software products which publishers tout as high-tech solutions, would appeal to schools with ESL populations. Limited use of CALL products also contrasts sharply with the heavy emphasis in the research community on non-native speaker software products.

The ESL-specific products that survey respondents did report using can be characterized as incorporating and focusing on visual components as aids to vocabulary acquisition. The four most popular packages, for example, provide language-specific practice by having students view a picture that represents a word or sentence, read text that accompanies the picture, and hear the word or sentence spoken. Students essentially match the three elements (visual, aural, textual) in various ways in various formats. Less frequently reported ESL products are also of the drill and practice variety, but less visually oriented; some include language practice, chiefly vocabulary work, in game-like formats. The 1.2% bilingual software products reported include Spanish-language games, on-line bilingual (Spanish/English) stories, and Spanish/English drill and practice programs.

Native-Speaker Software

Of the native-speaker software products reported by respondents, computer tools are the most widely used with ESL learners. Writing tools—which include word processors, desktop publishing and story-building software—are clearly the most popular. One writing/publishing tool that is frequently cited is the Bilingual Writing Center (43 instances). This package has been adopted by a number of schools providing bilingual education in New York City.

The writing/publishing trend reflects software usage in schools overall where composing and creating documents is increasingly undertaken on computers. Software tools for presenting projects and reports (e.g., Slideshow, Kidpix, etc.), make up the second type of most commonly used products in this category. Reference software (e.g., encyclopedias, databases) ranked third under the tools category.

A great deal of native-speaker software for the content areas is apparently being appropriated by ESL professionals for use with their students (41.1%). Native-speaker products tend to be rich in content and motivate use of realistic problem-solving strategies and accompanying discourse. Their designs, unlike ESL-specific products, are not preoccupied with form and discrete language learning objectives. On the contrary, they are designed for learners to be acting on and thinking about relevant content *using English*. Such products emphasize real tasks that require language *use* rather than the automatic or metalinguistic knowledge that tends to be the focus of most non-native speaker software.

THE FOLLOW-UP INTERVIEWS

To determine the reasoning behind why teachers are apparently opting for native speaker versus ESL-specific software products, and to gain a sense of what teachers actually *do* with these products in their efforts to support language and literacy development, telephone contact was made with reporting ESL and bilingual teachers in New York State. Those interviewed are language teaching professionals working with grades K -12 who, through the state wide survey,

self-identified as using computer technology successfully in their classrooms. In the written survey, 118 respondents indicated that they would be willing to discuss further their uses of technology with their ESL or bilingual students. Fifty-six of these teachers were interviewed. The reduction in numbers from 118 potential respondents to 56 contacts is due to several reasons:

1. Some teachers had moved and the replacement teacher did not use technology.
2. Some teachers no longer had access to technology that they had when surveyed.
3. Some of the teachers serviced several schools and completed surveys for more than one building.

Phone interviews consisted of open-ended questions about practices with computer technology. To begin with, the teachers were asked about grade levels, language backgrounds, and type of instructional support they provided ESL learners. They were then asked what kind of computer programs they found to be most useful with their students and why. This deliberately open-ended question was successful in leading teachers to explain beliefs about the uses of computer technology in the classroom. An attempt was made to draw the teacher into providing a rationale for using computer technology and some specific examples of how a lesson might be constructed around the technology. Finally, questions were asked both about how the computer is integrated into the lesson and also about how the ESL lesson integrates across the curriculum.

While some sense of the use of technologies was gained from these telephone interviews, the quality of response was unavoidably uneven. In some instances teachers spoke between classes or from a phone in a noisy hallway. In others, teachers had time to elaborate. Furthermore, some teachers were able to articulate their beliefs spontaneously in a way that others were not. Despite these constraints, the following picture of the use of computer technology for ESL/bilingual students emerged.

Access to Computer Technology

Access to computer technology is very uneven and, according to interviewees, depends on several factors:

- the location of the school (e.g. inner city vs. suburb)
- resources available
- the status of the ESL/bilingual program in the school
- the degree of cooperation and coordination between mainstream and ESL/ bilingual teachers
- the ability of teachers to write successful technology grants

Teachers' Use of Computer Programs

Teachers like using computer programs because they are motivating, they give instant feedback, they allow users to progress at individual rates, and they often provide assessment components. Some teachers also like them because they provide a space for student-student interaction away from the teacher and aide. Broadly speaking, the teachers interviewed can be divided into two groups.

1) Those who regard computer-based activity as separate from regular classroom activity. For these teachers, the computer is used mainly to practice skills or as a reward for successful classroom work. These teachers are also less inclined to integrate across the curriculum or collaborate with colleagues (or are operating in situations less conducive to such practices).

2) Teachers who try to use computer programs in creative ways to stimulate student thinking. For them ESL is not a separate subject in the curriculum, but rather a space where the content of social studies, science, and math can be made more accessible to the non-native speaking student population. They tend not to use ESL software (unless the students are beginners) and instead prefer native speaker software that deals with relevant content topics. They also see computer use as being a part of a larger whole of classroom activity. Typically, these teachers see the technology as a means of enabling students to construct situations and obtain information that can be brought back to the

whole class and that can serve as stimuli for rich language use activities. From these teachers, the following kinds of computer use were identified:

- Emergent literacy (K - early elementary): Alphabet and spelling programs are used in developing basic literacy skills. Additionally, graphics programs are used to support learners in making connections between images and text. Graphics often serve as a springboard for discussion and writing in the target language.

- Literacy through stories (elementary): Teachers use programs that allow students to choose environments and graphics to support the stories they write. There is preference for software that allows students to write, voice record their stories, and listen to the playback as they follow the text on the screen. Some use of book-length reading programs was also reported. Here, while reading the story, learners can access explanations and animations through hypertext links.

- Literacy through personal journal writing (elementary - middle): Word processing is used as the medium for interactive dialogue journals. Personal entries and responses are saved on disk.

- Literacy through content (upper elementary - middle): Social studies, science, and math programs are used by ESL teachers as part of interdisciplinary, theme-based activities. Multimedia encyclopedias are also used for content research.

- Literacy through publishing (upper elementary - middle): Word processors and desktop publishing packages are used to create booklets and newsletters. Multimedia presentation tools are also used by students to create slide shows and photo displays.

- Literacy through problem solving (upper elementary - middle - high): Interactive games and simulations are used in conjunction with content-based work. In such programs students make thoughtful choices based on their understanding of text and visual materials. These choices entail immediate consequences.

- Literacy through telecommunications (middle - high): Email is used to connect students to other schools, to experts, and to shared problem-solving hubs. There is also a growing use of the Internet for accessing information relevant to students' native language and culture, to the interests of individual students, and to support mainstream classroom work.

- Autonomous usage with integration across the curriculum (high): Here computers are used as tools by students as they work on their own projects. When the system is networked, students are able to access their work in a variety of content areas from a number of locations in the school building.

ESL versus native-speaker software

Teachers reported strengths and weaknesses with both ESL and native-speaker software products.

ESL software: Most of the ESL software in use is relatively old and is used by teachers to practice vocabulary and grammar. They used it mostly with beginners and those new to computer technology. Several teachers mentioned a "beginner awe" which helps to maintain motivation. However, the inherent "skill and drill" nature of this software soon leads to boredom, and sometimes forms of coercion have to be introduced to keep children on task. There are newer ESL packages on the market, but, while they are more interactive in that they combine audio and graphics with text, many teachers feel that they do not engage students with language beyond a superficial level. Moreover, these packages are relatively expensive.

Native-speaker software: This type of software is preferred by the vast majority of teachers because it helps to develop literacy skills embedded in the contexts of the whole curriculum. They use programs which bring social studies, language arts, science, and math into the ESL classroom and which encourage students to create content-appropriate language. Software contexts range from simple problem-solving activities to full scale simulations. Another use of native speaker software is as a tool for publishing. Here use ranges from simple poster or banner making to sophisticated desktop publishing or presentations.

In the Elementary Grades

For beginning students, teachers tend to use an array of basic skills language arts software for letter recognition, basic vocabulary, and spelling. They report that students like the instant feedback and the speech component that is now available in many programs. This is fun (and motivating) when it comes from a machine, and the teachers believe that students practice longer on the computer than they would in regular class. These programs also have attractive graphics and usually some kind of game component. The dynamic is also different from regular class because with computers the students have a certain amount of control over the activity (using the mouse, for example) so they are not being directed by the teacher as much as they would be in regular class. Often those who are frustrated in class (or who are at risk of being left behind) can turn to the computer and work in a non-threatening environment. The teachers often give ESL students below grade level computer programs and encourage them to catch up at their own pace. The computer also is a way for shy students to interact with each other without the inhibiting presence of teachers, aides, and translators.

For students who have already mastered the basics, native-speaker reading and writing programs are very popular. Especially popular are programs that 'read' stories out loud. Students can follow the audio portion of the story while simultaneously following its text highlighted on the screen. In the writing programs, students can click on graphics and construct a picture which then serves as a stimulus for writing. In some situations, the students construct stories on-screen which they then bring back to the whole class. In doing this, the students gain confidence and feel in control of their stories in a way that would be difficult to replicate without the technology. One teacher conducted a multicultural magazine project in which the ESL students interviewed people from their community, wrote stories, edited, and published a magazine. Their work was chosen by the local newspaper for a special supplement.

Some elementary teachers bring content from social studies, science, and math into ESL instruction at this level. They use programs like *The San Diego Zoo* in which the students can find out content information for projects, or math simulations where the students have a shopping list and a certain amount of money. Typically with these programs, the teachers spend

time initially building and checking prior content knowledge and afterwards in sharing the outcomes of these activities.

Some of the programs teachers use have built-in assessment components and these are well received, especially when they can be used to impress parents.

In the Middle School

At this level, word-processing is frequently mentioned by teachers. Rather than more mainstream commercial word-processing programs, teachers like to use programs with good graphic support as they find that the graphics help to stimulate writing. Students drag in complicated pictures which serve as a starting point for discussion and writing. Another benefit is that the computer can save students' work for the teacher to look at later. This is very useful when learners are all working on different stories within different time frames. Teachers also like to use desk-top publishing software so that students can publish their work with attractive visual effects.

A major concern of middle school teachers is that the ESL class should serve chiefly as a direct support to the content areas of the curriculum. They believe that they can best serve their students' needs by working with the concepts and vocabulary of social studies, science, and math; consequently, they try to ensure that their ESL work is congruent with the rest of the curriculum. To further this end they make extensive use of software that deals with historical, geographical, or scientific topics. They like software that requires decision making and that stimulates thinking, prediction, and problem solving. Typically teachers use some form of simulation software in which the students construct a design (a world, a farm, an insect) and then use it for classroom follow-up activities.

While there is a general reluctance to use ESL software because of its inability to foster creativity, some teachers find it useful for short periods with beginners.

In the High School

High school students are a lot more autonomous and prefer to work individually on computers. A teacher only has to show the students initially how to operate the machine and begin on a program and then they work by themselves. Reference programs (encyclopedias) are used a lot at this level as students do their research for other content areas. One teacher uses a bilingual math program and finds it good. She says that math problems on the computer are more fun and there is less of a sense of being "wrong" if the students do not get the correct answer. She also uses logic programs and geometry programs. On the whole, though, there is less group activity and more autonomous usage of native-speaker productivity tools with high school students.

Email and the Internet

Several teachers use a program set up by National Geographic which involves a software package and email organized around various social science and science themes. National Geographic provides a hub and sets problems for students who have to perform experiments and gather data which they then feed back into the hub. The students are on teams with students in other schools and use email to communicate and complete assignments. Email is also used in one case for the students to communicate with other students learning English in other countries.

The Internet is used for access to ESL web pages, stories that relate to the students' own cultures (mainly Hispanic) and also for access to sites that have direct relevance to students' lives—the shoes they wear, the movies they watch, and the businesses where family members work.

IMPLICATIONS

Current thinking in the field of second language and literacy acquisition would ideally see interaction with electronic texts as task-based and socio-collaboratively oriented instead of seeing students drilled in isolation from the rich context of school life. These software usage findings and reports from the field suggest that, in the case of self-identifying users of technologies with ESL students, quite a bit of usage is in keeping with contemporary beliefs and practice in second language learning. These language professionals are, in many instances, using technologies as tools through which and around which literacy skills are socially and collaboratively built. Teachers appear to be tailoring tasks and guidance for their students around electronic texts and tools, emphasizing meaningful interpretation and production of target content, in the target language.

These trends in software selection and use also suggest that most reporting teachers perceive the computer less as a delivery system and more as a tool with which, and through which, language skills can be developed in task/process-oriented frameworks. It may also be that teachers who use these products with their ESL students are simply resourceful teachers—making use of what is available. These trends may also be reflecting a sensitivity to the importance of content richness and the conceptual needs of ESL children. The apparent widespread use of tools-based software may be a response to ESL children's needs for enhanced literacy development activity as well as their need for empowerment through technology.

CONCLUSION

For two decades now, the education sector has appropriated computer technology to serve teaching and learning across the disciplines. As advances in technology have developed, so has the rationale for incorporating this medium into daily instructional streams matured. For example, in the earliest days of computers in education, machines were viewed as instructional

delivery systems whereby a given body of knowledge could be transmitted to students by virtue of its being on a screen and allowing some rudimentary forms of "interaction." Computers were generally conceived as teaching machines that would take on responsibility for training particular skills and content thoroughly and uniformly. They represented, after all, instantiations of "high technology," a concept still at the core of our understanding of the relationship between humans and machines.

Recently, however, the computer is being viewed more as an integral part of socio-collaborative learning activity and less as a means by which knowledge and skills are transferred to learners (Chiquito, Meskill & Renjilian-Burgy, 1996; Johnson, 1985; Meskill & Swan, 1996; Snyder & Palmer, 1986). One discipline in which these shifts in perception concerning the role of computers in the teaching and learning process have been particularly distinct is in the field of language learning. Once considered an ideally "patient partner" with which learners of another language could endlessly drill and practice until mastery occurred, the computer is now more widely viewed as a tool through, and around which, socio-collaborative language learning can take place. This shift in thinking directly parallels shifts in our understandings about the best route to learning language in general, and empowering linguistic minorities in particular.

Theory and practice in second language learning has moved from treating the enterprise as one of mimicry and memorization to one that is a complex, multidimensional process influenced more by the interaction of the individual and the contexts of acquisition than by notions of standardized, overt forms of cognition. It has moved away from viewing language as a static set of automated processes towards one that accounts for the multiple, complex aspects of language as a central feature of human identity. Language teaching practice has consequently moved away from emphasizing the learning of discrete linguistic items to activity that orchestrates full experiences of, and involvement in, language as it manifests itself in reality; that is, as a means of making and understanding meaning.

Like all innovation, however, developing notions of teaching and learning, with and without technology, take time to influence educators and become established in practice. In the area of second and foreign language learning, this is very much the case. New understandings

of how language is best learned and acquired have been slow to influence classroom practice. The reasons for this are many and are principally and intricately tied to notions of language as it is manifest in personal, social, and national identity. There remains in the minds of the U.S. linguistic majority, educators included, a package of veritable myths concerning language, how it is learned, and why (Light, 1996; Reyes, 1992). The consequences of these misunderstandings are many and pervasive, and especially troubling as to how they affect linguistic minority children and their school life. In terms of computers, there is risk in bringing technology to language learning contexts where these beliefs persist. As is evident in these initial findings, there is also tremendous promise of change.

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